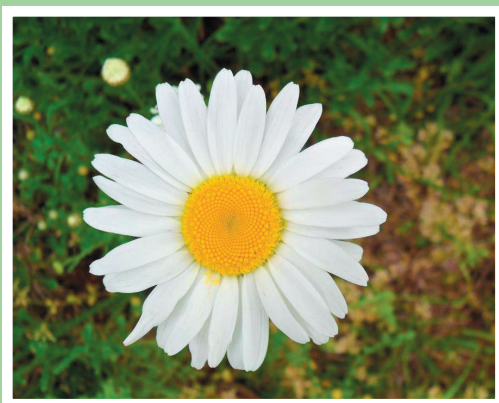




United States Department of Agriculture

Field Guide for Managing Oxeye Daisy in the Southwest



Forest
Service

Southwestern
Region

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Cover Photos

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Oxeye daisy (*Leucanthemum vulgare* LAM.)

Sunflower family (Asteracea)

Oxeye daisy is an invasive weed in Arizona and New Mexico. It is listed as a potential noxious weed in New Mexico. This field guide serves as the U.S. Forest Service's recommendations for management of oxeye daisy in forests, woodlands, and rangelands associated with the Service's Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also includes four national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Oxeye daisy (synonyms: bull daisy, button daisy, field or white daisy, Marguerite, and others) is a short-lived perennial in the sunflower family. Native to Eurasia and northern Africa, it has been sold as an ornamental but has escaped into the wild, often in restoration seed mixtures. Oxeye daisy is showy and resembles several native daisies. It grows in clustered masses and is distinguished by uniform solitary flowers growing upright from the end of branches.

Growth Characteristics

- Perennial, herbaceous, broadleaf plant growing erect 1-3 feet tall.
- Rosettes grow in clumps resulting in plants with multiple flowering stems.
- Stems are glabrous to slightly pubescent, 12 to 30 inches tall and are simple to moderately branched.
- Leaves are sessile and spirally arranged on the stem. Their shape is lanceolate or ligulate and their margins are coarsely-toothed. Leaves are hairless, dark green and glossy.
- Flower heads are solitary at the stem tips and 1 to 2 inches in diameter. Central disc flowers are many, tiny, and bright yellow. Outer ray flowers (20 to 30) are white, petal-like, and sterile. Flowers throughout the summer growing season.
- Reproduces via seed and creeping rhizomes; seeds are single, small and black (1 to 1.5 mm long)

without a pappus. One plant produces thousands of seeds that remain viable in the soil for more than 6 years. There are no mechanisms of seed dormancy, and germination can occur throughout the year when conditions are favorable. However, establishment from seed is most common in the spring.

- Over-wintering buds are on rhizomes at or near the soil surface. New stems commonly emerge in early spring (April-May). Plants die back to ground under drought conditions, but rosettes can grow from rhizomes when fall moisture and temperature conditions are favorable. The longevity of individual plants or rhizomes has not been determined.
- Oxeye daisy has a rank, unpleasant odor that is especially noticeable in the mid- summer or when leaves are crushed.

Ecology

Impacts/threats

Oxeye daisy can crowd-out preferred forage species reducing carrying capacity for livestock and the value of hay. Where it spreads onto rangeland, it can lower plant community diversity and degrade wildlife habitat.

Location

Oxeye daisy is widely found since it grows in a wide range of soil textures; however it prefers heavy moist soil. It can be common in pastures and hay meadows; rangeland; along roads, trails and rights-of-way; residential and industrial areas; and near streams and other water sources. It has a low tolerance for shade and prefers open areas. This weed is well adapted to disturbance and often migrates to drier upland sites once established.

Spread

Oxeye daisy has no specialized morphological features to facilitate seed or root dispersal so people, vehicles, and animals are probable vectors for off-site spread. Seed is easily dispersed by water, humans, birds, and rodents; it can spread over long distances by adhering to surfaces and undercarriages of off-road vehicles and road maintenance

equipment. Oxeye daisy seed is spread from infested hay meadows when plants with flowers are baled with hay. It has been reported that oxeye daisy has been included in seed mixtures that were prepared and planted in meadows and various areas intended for restoration, such as after wildfire or areas planted for erosion control.

Invasive Features

Flower stems of oxeye daisy persist through the winter thereby allowing a long seed dispersal period from September through March. Germination requirements are not specific; new plants may propagate any month of the year. Its basally growing rhizomes allows moisture storage and access to deeper soil moisture. Prolific seed production coupled with high germination rates and long seed viability make this weed highly competitive.

Management

Early detection and management of small populations before they can expand into larger populations is extremely important for oxeye daisy control. Due to copious seed production and a high germination rate, unmanaged small populations may grow quickly and become more difficult to eradicate. Small, isolated infestations on otherwise healthy sites should be given high priority for treatment. Perimeters of infestations should be treated first and then worked toward the center. Regardless of the approach followed, it must be recognized that oxeye daisy cannot be effectively controlled within a single year or by using only one method. Complete control will likely require 3-6 years of repeated management methods. The following actions should be considered when planning an overall management approach:

- Healthy plant communities should be maintained or encouraged to limit oxeye daisy infestations.
- Detect, map, and eradicate new populations of oxeye daisy as early as possible. Keep annual records of reported infestations.

- Implement monitoring and a follow-up treatment plan for missed plants and seedlings.
- Use only certified weed-free seed when planning any restoration activity.
- Check hay and straw for presence of plant fragments or seed before using them in areas without oxeye daisy; feed certified weed-free hay or pellets to horses in the backcountry.

Table 1 summarizes some management options for controlling oxeye daisy under various situations. Choice of method(s) taken for oxeye daisy control depends on numerous factors including the current land use and site condition; accessibility, terrain, and climate; oxeye daisy density and degree of infestations; non-target flora and fauna present, etc. Other considerations include treatment effectiveness, cost, and the number of years needed to achieve control. More than one control method may be needed for each site.

Physical Control

Since oxeye daisy reproduces by seed and by producing rhizomes, physical methods that can destroy the entire plant are preferred. Methods that repeatedly stress and/or attack the root system are especially effective.

Manual Methods

Hoeing, digging, cutting, or grubbing are effective management options on smaller, isolated populations. If a mower or weed eater is used for suppression, then cut before plants produce seed and repeat as necessary through the growing season. Plant material should be bagged, piled, or burned.

Mechanical Methods

Mowing – Repeated mowing should be viewed as a suppression technique; therefore, plant kill should not be expected. In localized situations, mowing can reduce oxeye daisy seed production, stress its carbohydrate root reserves, and decrease its competitive ability against desirable grasses and forbs. A rotary mower is ideal for larger populations, but a hand-held weed eater is sufficient for smaller populations.

Table 1. Management options*

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides, fencelines, or noncrop areas	Mow close to the ground multiple times during growth season. Combine mowing with summer herbicide application.	Clean machinery following activity in infested areas. Train road crews to identify and report infestations.	No USDA-approved biological control agent is available.	For ground application, use ATV, truck-mounted, or tractor-pulled spraying equipment. Wash under vehicle after application to prevent spread.
Rangelands, pasture, or riparian corridors	Use repeated tillage only in areas to be re-seeded. Combine with herbicide spraying. Prescribed burning is not effective.	Use certified weed-free seed and hay. Avoid driving directly through infestation. Re-seed with desirable plants that can compete.	Avoid grazing infested pastures during the early spring when oxeye daisy is the primary green forage. No USDA-approved biological control agent is available.	For extensive and dense infestations, use ground or aerial broadcast spraying. For sparse infestations, use spot spraying with a backpack or ATV sprayer.
Wilderness, other natural areas, and/or small infestations	Hand-remove or cut before flowers develop; removal of the whole root is necessary. Pile or remove debris.	After passing through infested areas, inspect and remove any seed from animals, clothing, and vehicles.	Same as above.	Use backpack or hand-held sprayers to spot-treat plants.

* Choice of a particular management option must be in compliance with existing regulations for land resource.

Plants should be clipped close to the ground in the spring, after bolting (but before seed set) and repeated again as necessary throughout the summer.

Tillage – In cultivated settings, repeated tillage can be an effective control option. However, this practice is feasible only in certain situations. Re-seeding following tillage is highly recommended since oxeye daisy is a pioneer species that will germinate rapidly from seedbank reserves following disturbance. Local conditions dictate when re-seeding should be accomplished. Typically in Arizona and New Mexico, desired grass and forb seed are planted in late summer or early autumn. Areas with suitable terrain should be tilled at 3-week intervals with a plow or disc to a depth of at least 4 inches beginning when oxeye daisy is in the rosette or early bolt stage in spring. If using machinery to manage oxeye daisy, equipment should be cleaned to prevent the movement of seeds or root fragments to uninfested areas.

Prescribed Fire

Little research has been conducted with regard to prescribed burning as a management option for oxeye daisy. Considering the moist environment preferred by the plant and the limited dried fuel produced in these areas, it is assumed that fire is not likely to produce enough heat to destroy a high percentage of seed or rhizomes. However, fire can be used as a means to dispose of debris.

Cultural Control

Prevention, early detection, and plant removal are critical for preventing oxeye daisy establishment. Where established, practices that encourage the competitiveness of desirable plant species and communities will make the environment less hospitable for oxeye daisy to survive and spread. Vehicles, humans, and livestock should be discouraged from traveling through infested areas; a program to check and remove seeds from vehicles and livestock should be

implemented to help stop dispersal. Always purchase certified weed-free seed when replanting is under consideration.

Biological Control

Grazing

Oxeye daisy is well adapted to top removal; thus, livestock grazing in infested pastures may suppress growth but is unlikely to provide long-lasting plant control. Oxeye daisy is not a preferred species because of its bitter taste. Horses, sheep, and goats reportedly graze oxeye daisy. However, this weed can become more abundant when grazing is not closely managed and other preferred species are taken first. Livestock that consume this weed in contaminated hay or free grazing should be held for at least 5 days before moving to weed-free areas to prevent the spread of viable seeds that may pass through the digestive system.

Classical Biological Control

No biological control agents have been approved by the USDA for use in controlling oxeye daisy in the United States.

Chemical Control

Herbicides are an effective and economical way to manage oxeye daisy, especially in range and pasture conditions. However, new populations often return within a few years of spraying from seed that is still abundant in the soil or from rhizomes not completely killed after treatment. To deplete the seed bank and attain long-term control, anticipate the need to monitor after any treatment and use follow-up herbicide applications for several years.

All herbicides recommended in table 2 will control emerged oxeye daisy when properly applied. On pastures and rangeland, several herbicides (including aminopyralid, metsulfuron, or picloram) are generally safe to apply since they are selective and their use typically benefits grass growth. These herbicides can be applied alone

in early fall after flowering and seed set. They are also effective when mixed in combination with 2,4-D (amine or ester formulations) and applied in spring during the rosette stage. Care should be taken when using 2,4-D alone or in combination as it has a restricted use designation in New Mexico. Other selective herbicides to consider include dicamba (alone or in combination with 2,4-D) or aminocyclopyrachlor in combination with metsulfuron. For oxeye daisy growing on stream banks or near the water's edge, consider using the Rodeo® formulation of glyphosate as it has an approved aquatic label. Glyphosate is non-selective; therefore, it is best applied as a spot spray to individual oxeye daisy plants to prevent damage to non-target plants (including woody species). Each herbicide product listed in table 2 will have different requirements and restrictions according to the label. Read and understand the label prior to any application. Consult the registrant if you have questions or need further detail.

Herbicides may be applied in several ways including backpack, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. For sparse populations, one person or a small team can spray oxeye daisy using an individual (spot) plant treatment (IPT) approach. Plants may be spot-sprayed by wetting the foliage and stems without dripping while using an adjustable spray nozzle attached to a hand-held or backpack sprayer.

Re-seeding an area following herbicide treatment can improve long-term control by increasing grass competition with oxeye daisy. In areas where re-seeding is planned, glyphosate can be broadcast sprayed for site preparation. Glyphosate is most effective when applied sequentially at about one-month intervals during the summer, coupled with grass seeding in the fall. Make the first application in early summer (June or July) and the second about a month later, provided green shoots are present. Sow perennial grass seed in late autumn as a dormant seeding (i.e., grass seedlings will not emerge until the following spring).

Table 2. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example¹	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example²	Time of Application	Remarks
2,4-D ester or amine formulations ³	several manufacturers	Recommended for use in combination with other herbicides listed below	3-5% as a spot spray	Spring while in seedling or rosette growth stage	2,4-D is selective for many broadleaf species but will not harm most grasses. 2,4-D is formulated in different strengths depending on the manufacturer. Read and follow label mixing directions.
Aminopyralid	Milestone	4 to 6 oz	3%	Prebud	For use on rangeland and pastures. Will control many broadleaf species
Aminopyralid + 2,4-D	GrazonNext Forefront R&P	2.0 to 2.5 pts	3%	Rosette to early flower	For use on rangeland and pastures. Will control many broadleaf species with little damage to grasses.
Aminopyralid + metsulfuron methyl	Opensight Chaparral	2.5 to 3.3 oz	n/a	Same as above	A selective granular herbicide for use on rangeland, pastures, non-cropland, rights-of-way, non-irrigation ditch banks, natural areas, and grazed areas in and around these sites.
Dicamba + metsulfuron + 2,4-D	Cimarron	0.5 to 1.0 oz	na	Same as above	Selective; affects many broadleaf species but will not harm most grasses.
Dicamba + 2,4-D ³	Weedmaster	2 to 4 pts	0.7% + 0.5% NIS ⁴	Seedling to rosette stage	Selective with a broad spectrum; may affect some sensitive pasture grasses such as bentgrass and legumes including alfalfa. Not for use near water.
Metsulfuron methyl	Escort	0.5 to 1 oz	1 gram per gallon	Early spring or late fall (at bud/bloom or rosette stages)	Selective; not for use on irrigation ditches or near waterways. Best used during warm, moist conditions; activity may be delayed during cold, dry conditions. Use 0.25% v/v NIS ⁴

Table 2. Herbicide recommendations (continued)

Common Chemical Name (active ingredient)	Product Example ¹	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example ²	Time of Application	Remarks
Picloram ⁵	Tordon 22K others	1.5 pts or 1.5 pints + 1 qts 2,4-D in spring	1 to 3 %	Combined with 2,4-D during spring or alone when applied in fall	Best applied during post-flower stage in early fall with sufficient soil moisture.
Glyphosate	RoundUp Rodeo	RoundUp: 1.3 – 2.7 qts Rodeo: 2.25 – 3.75 qts	RoundUp: 1 to 1.5% Rodeo: 0.75 –1.5%	At rosette stage	Non-selective; not soil active. Rodeo is registered for aquatic use.

¹ Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with oxeye daisy.

² Herbicide/water ratio – As an example, a gallon of spray water with a 3% mixture is made by adding a sufficient volume of water to 4 oz of herbicide until a volume of one gallon is reached ($4 \text{ oz/gal} \div 128 \text{ oz/gal} = 0.03$ or 3%).

³ 2,4-D is a restricted use pesticide in New Mexico only. A certified applicator's license is required for purchase and use.

⁴ NIS is an abbreviation for Non-Ionic Surfactant, an additive commonly recommended by herbicide labels for post-emergent foliar herbicide application.

⁵ Restricted-use pesticide – A certified applicator's license is required for purchase and use.

Control Strategies

Because each treatment situation is unique, the strategy adopted for managing oxeye daisy must involve careful planning. Persistence and a long-term commitment is a must for oxeye daisy control. Treated areas should be monitored periodically, and measures should be taken to control missed plants and newly emerged seedlings. It is also important to monitor the return of desirable native plant species.

Experience with integrated methods for controlling oxeye daisy is incomplete. As is the case in managing most weed-infested areas, integration of techniques such as mowing and herbicide should be beneficial since the impacts of combined control measures are often cumulative. Integrating re-vegetation through broadcast seeding or a

no-till drill to increase competitive pressure on oxeye daisy should always be considered where feasible.

Although research is limited, especially in the Southwest, combining herbicide with nitrogen fertilizer in a pasture situation has been suggested as another effective strategy for managing oxeye daisy. A project conducted in a mountain meadow pasture in eastern Washington has reported that nitrogen applied at 80 lbs/acre (without herbicide) will provide an excellent forage response that can suppress oxeye daisy growth and dominance. Because experience is limited with such an approach in the Southwest, it would be best to first test this strategy on a limited area before undertaking a large project area.

References and Further Information

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Suggested Websites

For information on invasive species:

<http://www.invasivespeciesinfo.gov/>
<http://www.invasive.org/weedus/index.html>

For information about calibrating spray equipment:

NMSU Cooperative Extension Service Guide #A-613 Sprayer Calibration at http://aces.nmsu.edu/pubs/_a/A-613.pdf

Herbicide labels online:

<http://www.cdms.net/LabelsMsds/LMDefault.aspx>

**For more information
or other field guides, contact:**

USDA Forest Service
Southwestern Region
Forest Health
333 Broadway Blvd., SE
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Or visit:

<http://www.fs.usda.gov/main/r3/forest-grasslandhealth/invasivespecies>

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